296-208

Ventilator Tests

You have the right to demand them of any Ventilator *before you buy.*

U.S. PATENT OFFICE
MAR -9 1925
DIVISION X

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MAR -9 1925
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Published by

N-L

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THE NICHOLS-LINTERN CO.

7960 Lorain Ave. Cleveland, Ohio

REPRESENTATIVES

Railway & Power Engr. Corp., Ltd., 133 Eastern Ave.,
Toronto, Ont., Canada

United Automobile Services, Ltd., Laundry Lane,
Lowestoft, England

Pharo Engineering Co., 517 Park Bldg., Pittsburgh, Pa.

A. C. Burleigh, Little Bldg., Boston, Mass.

Gus W. Wagner, 1011 Majestic Bldg., Detroit, Mich.

Jameson-Ross Co., Straus Bldg., Chicago, Ill.

F. F. Bodler, 903 Monadnock Bldg., San Francisco, Cal.

A. W. Arlin, 519 Delta Bldg., Los Angeles, Cal.

VEHICLE VENTILATORS are applied for the purpose of exhausting the bad air in a compartment so that fresh air may come in from the outside.

Ventilators should be so designed as to perform **without drafts**, without lowering of the temperature, without admitting disagreeable outside weather conditions, without discomfort of any kind to the occupants of the compartment.

The "exhausts" or "changes of air" should be accomplished sufficiently often to maintain healthy conditions continually.

It is generally accepted that from ten to twenty changes of air per hour are necessary for true ventilation. For example, a vehicle with an interior capacity of 900 cubic feet requires an exhaust through its ventilators of from 9000 to 18000 cubic feet per hour.

It must not be overlooked that there is one factor in the installation which has a decided bearing on the exhaust performance of any ventilator. This factor is the grill, whether regulative or non-regulative, which is used for the interior finish.

The grill acts as a retardant to some extent, according to its design, and in estimating the number of ventilators required for a compartment it is of great importance to make full allowance for this retardation.

* * * * * *

With these things in mind, **study** your ventilation problem and **know** its solution, **before you buy.**

So you may **know** how well N-L's will solve it, this booklet is placed in your hands.

N-L's will deliver—100%

IN THIS BOOKLET we show the complete line of N-L Bus, Street Railway and Closed Car Ventilators. With each individual ventilator we have recorded, in table form, the results of recent tests for exhaust capacity.

In many cases, owing to the wide choice of grills adaptable to the ventilator under test, no grills whatever were used—and the reading for that ventilator is a pure indication of exhaust capacity. The retardative effect of the styles of grills most commonly used is indicated in a foot note.

Where grills were used, the test figures so state.

A comparison of the exhaust figures given for any vent, in conjunction with the figure for retardation of any grill, will simplify the computations when estimating the ventilator needs for any compartment.

In calculating the number of ventilators necessary for buses to be operated in the city, we suggest that your requirements be based on a speed average of 15 miles per hour. For interurban service, 20 miles per hour.

Where regulation of the ventilation seems necessary, we suggest that both regulative and non-regulative grill types be used. This arrangement will assure moderate ventilation when the regulative grills are entirely closed.

Method of Testing N-L Bus and Closed Car Ventilators

ROUTE: The route covered various conditions which effect the operation of exhaust ventilators, such as elevations, depressions, buildings, woods, etc. No allowance was made for these conditions—they were accepted as common, and therefore fair obstructions.

WIND VELOCITY: The test trips were made on routes running east and west. The wind direction was east, with varying velocities during the periods of test. Trips were made at **one speed** in each direction and the two results averaged—the same being done for each rate of speed indicated in the tables. This method renders the wind velocity a negligible factor and gives a true and proper reading of the anemometer. The readings may be accepted as a **minimum** for calculations.

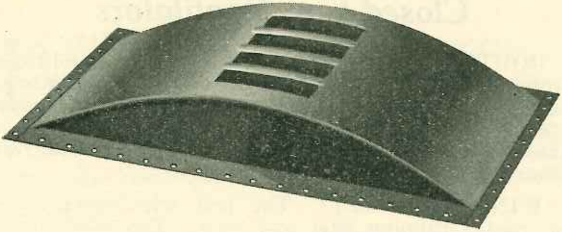
> (It is extremely important that readings **against** the wind be averaged with readings **with** the wind—"exhausts" against the wind may easily register double those with the wind.)

ANEMOMETER: Inasmuch as the largest opening in the ventilators was 6″ in diameter, the anemometer was centrally located in a 6″ cylinder. All air passing through the ventilator passed first through the cylinder and the speed was registered in lineal feet. The cubical measurement was obtained by multiplying the lineal feet by the area of the cylinder.

RETARDATION OF GRILLS: After repeated road and laboratory tests it was determined that the retardation of N-L Grills is approximately as follows:

Non-Regulative Grills	14%
Regulative Grills	20%
Dome Light Regulative Grill	15%

Descriptions of the methods used in testing N-L Street Railway Ventilators are shown in the "Test Tables" printed with each of the railway ventilators.

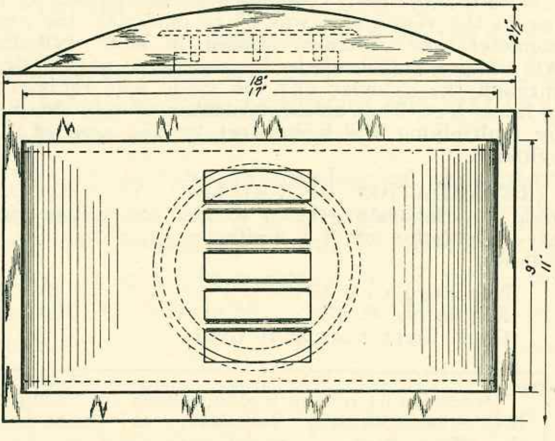


N-L BUS VENTILATOR

Type "AA"

The N-L Type "AA" Ventilator is made of Armco galvanized sheet iron. Weight, 3½ lbs.

No. 10 Non-regulative grill or No. 20 Regulative grill used with this ventilator.



Actual Road Test of Exhaust Capacity

N-L Bus Ventilator

Type "AA"

(as illustrated on opposite page)

Test made February 2, 1925.

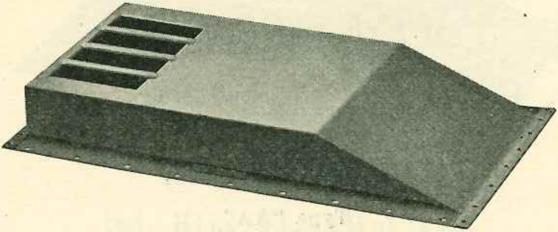
Miles per hour	Exhaust per hour
10	1980 cu. ft.
15	2580 " "
20	3480 " "
25	4116 " "
30	4680 " "
35	5280 " "

The above test was made without grills.

Retardation of No. 10 non-regulative grill is 14%.

Retardation of No. 20 regulative grill is 20%.

Grills listed on pages 26 and 27.

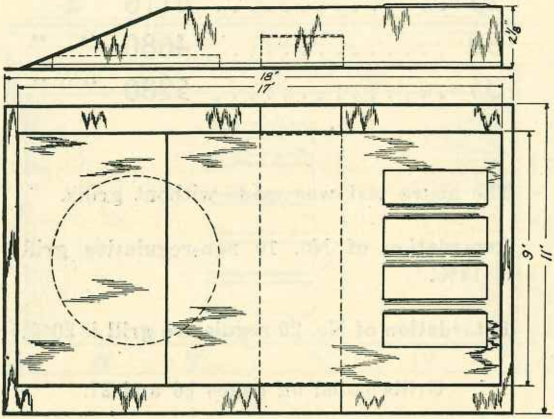


N-L BUS VENTILATOR

Type "CC"

The N-L Type "CC" Ventilator is made of Armco galvanized sheet iron. Weight, 3½ lbs.

No. 10 Non-regulative grill or No. 20 Regulative grill used with this ventilator.



Actual Road Test of Exhaust Capacity

N-L Bus Ventilator

Type "CC"

(as illustrated on opposite page)

Test made February 2, 1925.

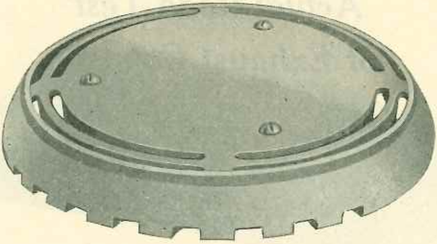
Miles per hour	Exhaust per hour
10	1880 cu. ft.
15	2532 " "
20	3312 " "
25	3816 " "
30	4320 " "
35	4858 " "

The above test was made without grills.

Retardation of No. 10 non-regulative grill is 14%.

Retardation of No. 20 regulative grill is 20%.

Grills listed on pages 26 and 27.

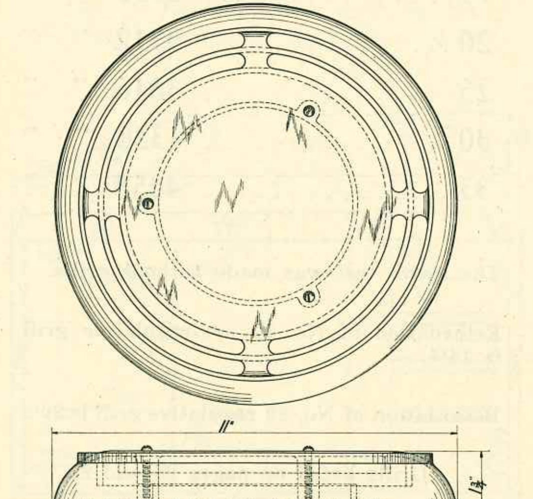


N-L BUS VENTILATOR

"Universal No. 1"

The N-L Universal No. 1 Ventilator is made entirely of Cast Aluminum Alloy. Weight, 2¾ lbs.

No. 10 Non-regulative grill or No. 20 Regulative grill used with this ventilator.



Actual Road Test of Exhaust Capacity

N-L Bus Ventilator

"Universal No. 1"

(as illustrated on opposite page)

Test made February 3, 1925.

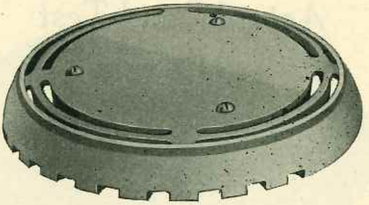
Miles per hour	Exhaust per hour
10	3084 cu. ft.
15	4054 " "
20	5124 " "
25	5762 " "
30	6480 " "
35	7020 " "

The above test was made without grills.

Retardation of No. 10 non-regulative grill is 14%.

Retardation of No. 20 regulative grill is 20%.

Grills listed on pages 26 and 27.



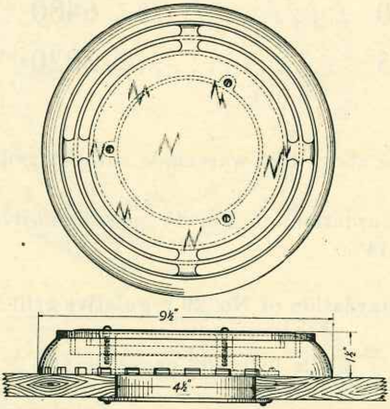
N-L BUS AND CLOSED CAR VENTILATOR

"Universal No. 2"

The N-L Universal No. 2 Ventilator is made entirely of Cast Aluminum Alloy. Weight, 2 lbs.

No. 30 Non-regulative grill or No. 40 Regulative grill used with this ventilator.

Applicable to Small Buses, Closed Cars, Taxicabs, Special Bodies.



Actual Road Test of Exhaust Capacity

N-L Bus and Closed Car Ventilator

"Universal No. 2"

(as illustrated on opposite page)

Test made February 12, 1925.

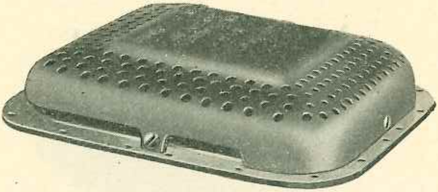
Miles per hour	Exhaust per hour
10	2100 cu. ft.
15	2580 " "
20	2820 " "
25	3660 " "
30	4260 " "
35	4860 " "

The above test was made without grills.

Retardation of No. 30 non-regulative grill is 14%.

Retardation of No. 40 regulative grill is 20%.

Grills listed on pages 26 and 27.



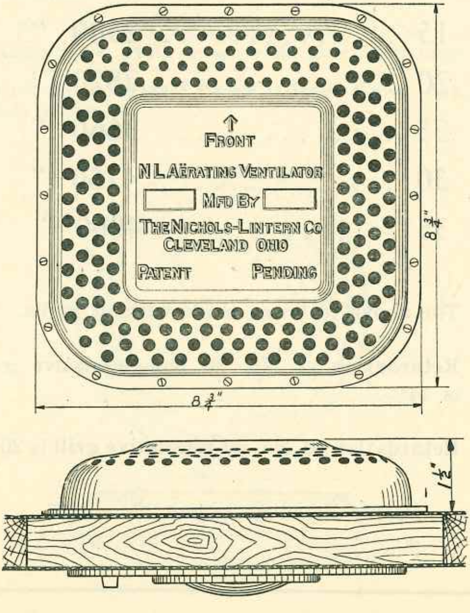
N-L BUS AND CLOSED CAR VENTILATOR

"Aerating Type"

The N-L Aerating Ventilator is made entirely of Cast Aluminum Alloy. Weight, 2¼ lbs.

No. 30 Non-regulative grill, No. 60 Regulative grill or No. 50 Dome Light Regulative grill used with this ventilator.

Applicable to Small Buses, Closed Cars, Taxicabs, Special Bodies.



Actual Road Test of Exhaust Capacity

N-L Bus and Closed Car Ventilator

"Aerating Type"

(as illustrated on opposite page)

Test made February 4, 1925.

Miles per hour	Exhaust per hour
10	1260 cu. ft.
15	1668 " "
20	2352 " "
25	2604 " "
30	3180 " "
35	3561 " "

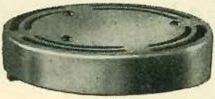
The above test was made without grills.

Retardation of No. 30 non-regulative grill is 14%.

Retardation of No. 60 regulative grill is 20%.

Retardation of No. 50 dome light regulative grill is 15%.

Grills listed on pages 26 and 27.



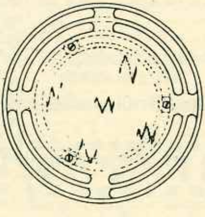
N-L CLOSED BODY VENTILATOR

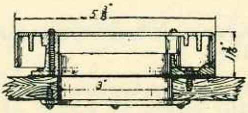
"Universal No. 3"

The N-L Universal No. 3 Ventilator is made entirely of Cast Aluminum Alloy. Weight, 1 lb.

No. 70 Ceiling ring is used with this ventilator.

Applicable to Truck Cabs, Commercial Bodies, Taxicabs, Special Bodies.





Actual Road Test of Exhaust Capacity

N-L Closed Body Ventilator

"Universal No. 3"

(as illustrated on opposite page)

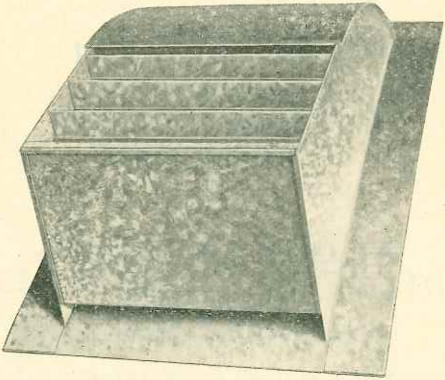
Test made February 4, 1925.

Miles per hour	Exhaust per hour
10	882 cu. ft.
15	1110 " "
20	1530 " "
25	1824 " "
30	2076 " "
35	2325 " "

The above test was made without grills.

There is no retardation when ceiling ring No. 70 is used.

Grills listed on pages 26 and 27.



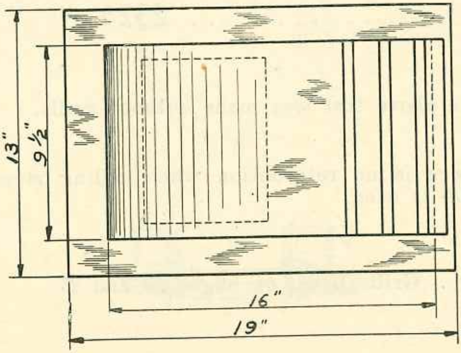
N-L ARCH ROOF RAILWAY VENTILATOR

Type "A"

The N-L Type "A" Arch Roof Ventilator is made of Armco galvanized sheet iron. Weight, 6½ lbs.

No. 80 Open grill or No. 90 Regulative register is used with this ventilator.

Applicable to cars having small roof radius.



Actual Road Test of Exhaust Capacity

N-L Arch Roof Railway Ventilator

Type "A"

(as illustrated on opposite page)

Test made January 2-6, 1924.

The following table gives results of tests made on the property of the Toronto Transportation Commission, under various conditions including different directions, wind velocities, downtown and outlying routes. This is a complete and composite test.

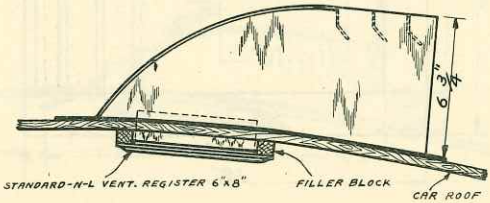
Test No. 1—3714 cu. ft. per hour
" " 2—5858 " " " "
" " 3—5328 " " " "
" " 4—4183 " " " "
" " 5—3344 " " " "
" " 6—4087 " " " "

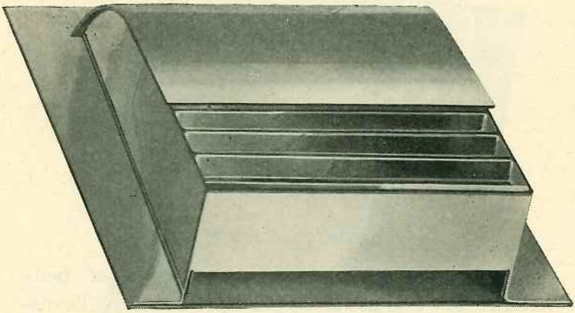
The above tests were made with No. 80 open grill.

Retardation of No. 90 regulative register is 4% of above readings.

These cars are equipped with 10 ventilators.
The cubical measurement is 2,350 cubic feet.
Average of 18.8 changes of air per hour.

Grills listed on pages 26 and 27.





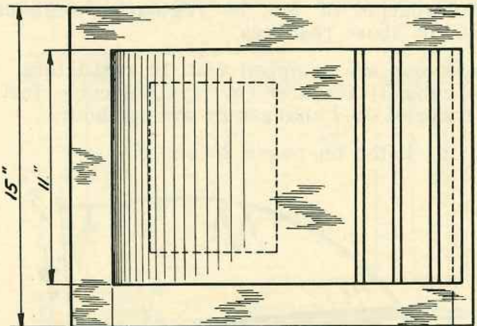
N-L ARCH ROOF RAILWAY VENTILATOR

Type "C"

The N-L Type "C" Arch Roof Ventilator is made of Armco galvanized sheet iron. Weight, 6 lbs.

No. 80 Open grill or No. 90 Regulative register is used with this ventilator.

Applicable to cars having large roof radius.



Actual Road Test of Exhaust Capacity

N-L Arch Roof Railway Ventilator

Type "C"

(as illustrated on opposite page)

Test made May 1, 1923.

The following table gives results of tests at various speeds under suburban service conditions on the property of The Northern Ohio Traction & Light Co.

Miles per hour		Exhaust per hour
Test No. 1	8	3000 cu. ft.
" No. 2	10	3800 " "
" No. 3	15	6000 " "
" No. 4	18	8000 " "

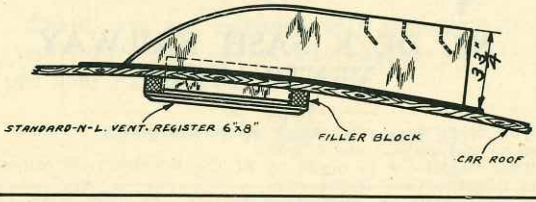
The above tests were made with No. 80 open grill.

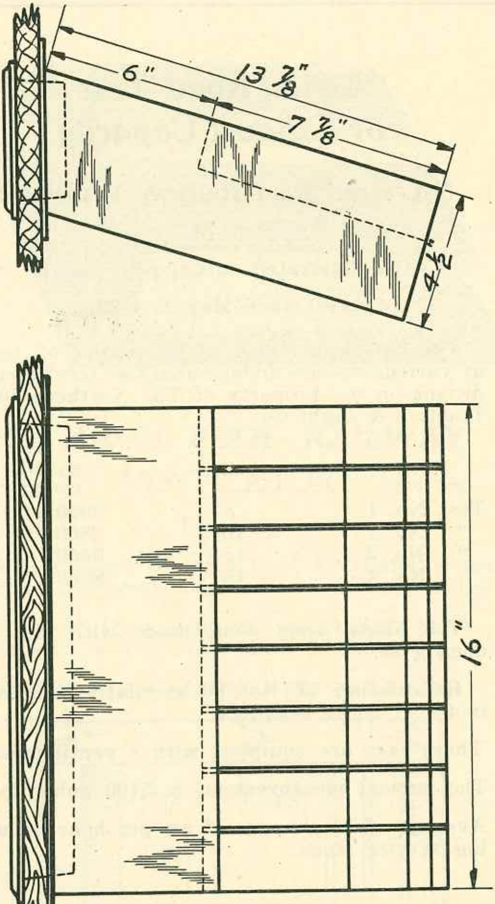
Retardation of No. 90 regulative register is 4% of above readings.

These cars are equipped with 8 ventilators.

The cubical measurement is 2,100 cubic feet.

Average of 16 changes of air per hour including service stops.





N-L DECK SASH RAILWAY VENTILATOR

Type "E"

The N-L Type "E" Deck Sash Ventilator is made of Armco galvanized sheet iron.

This ventilator is made to fit the service requirements and construction of the car.

Special grill or regulative register is used with this ventilator.

Actual Road Test of Exhaust Capacity

N-L Deck Sash Railway Ventilator

Type "E"

(as illustrated on opposite page)

Test made January 2-6, 1924.

These tests were made on the property of the Toronto Transportation Commission under various conditions including different directions, wind velocities, downtown and outlying routes.

Test No. 1

2760 cubic feet per hour

Test No. 2

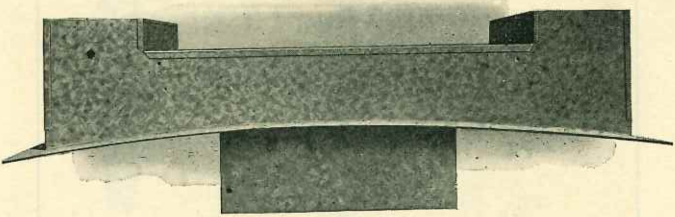
2605 cubic feet per hour

The above tests were made with No. 80 open grill.

Retardation of No. 90 regulative register is 4% of above readings.

These cars are equipped with 8 deck sash ventilators. Average of 10.2 changes of air per hour including service stops.

Grills listed on pages 26 and 27.



N-L ARCH ROOF RAILWAY VENTILATOR

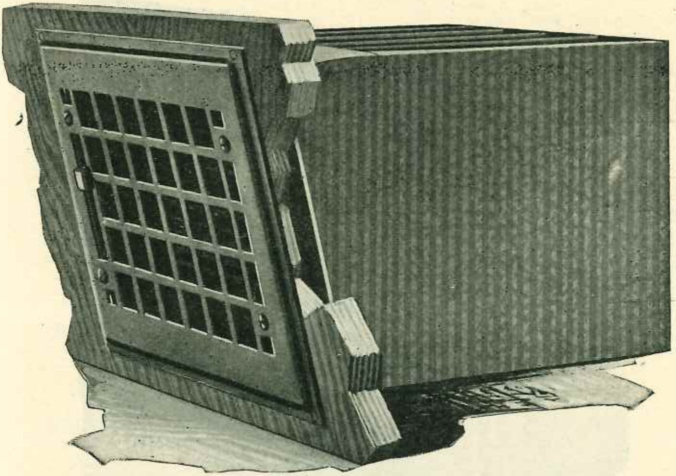
Type "B"

The N-L Type "B" Arch Roof Ventilator is made of Armco galvanized sheet iron.

It is located on center line of the roof. Where no trolley board is used, the ventilator is built the same as shown in illustration, but not lowered in center.

This ventilator is also very effective on the vestibule roofs of deck sash cars.

Special grill or regulative register is used with this ventilator.



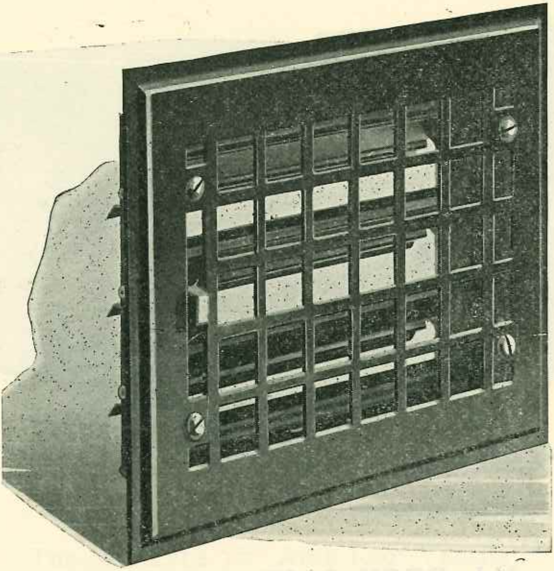
N-L DECK SASH RAILWAY VENTILATOR

Type "D"

* * * * * *

The N-L Type "D" Deck Sash Ventilator illustrated above, also type "E" shown on page 20, and type "B" Arch Roof Ventilator described on the opposite page can be furnished **specially built** to meet **any** specifications or requirements.

This feature is of importance where ventilators are to be installed in cars already in operation.



HE N-L All-Wrought Steel Regulative Register and Non-Regulative Grill are very light in weight. The standard 6"x8" Register weighs 1¾ pounds.

The design is limited to plain lattice giving the greatest possible free air opening in the face.

It is usually furnished in black japanned finish. However, at a slight additional cost it can be furnished in White Japanned, Oxidized Copper, Statuary Bronze or any special enamel desired. This feature should be taken into account when considering the interior finish of your cars.

N-L Regulative Registers do not rattle.

Installation

It is very important that ventilators are installed in the proper manner.

Ventilators should be located on the roof and the holes for the ventilator opening cut.

After canvas is stretched on the roof, cut the ventilator holes and install ventilators, using plenty of STAY-TITE between the ventilators and the roof.

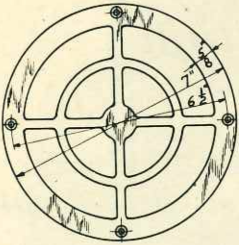
N-L Ventilators in themselves are thoroughly weatherproof and by using plenty of STAY-TITE under the ventilators the installation will be weatherproof.

STAY-TITE is permanent, for it retains its elasticity and is not affected by expansion and contraction, nor does it become brittle and break away.

If the above suggestions are followed there will be no ventilator troubles encountered.

Various Types of Grills for Interior Finish

No. 10 NON-REGULATIVE GRILL

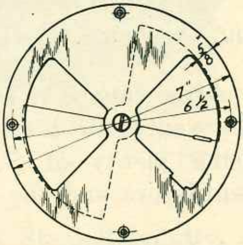


Weight 5 ozs.

Polished Cast Aluminum Alloy. Designed for use with the type "AA", type "CC", and "Universal No. 1" Ventilators.

Hole in roof to be cut 6″ dia.

No. 20 REGULATIVE GRILL

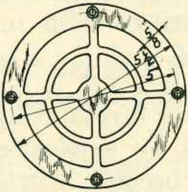


Weight, ¾ lbs.

Polished Cast Aluminum Alloy. Designed for use with the type "AA", type "CC", and "Universal No. 1" Ventilators.

Hole in roof to be cut 6″ dia.

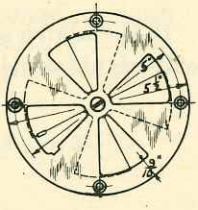
No. 30 NON-REGULATIVE GRILL



Weight ¼ lb.
Polished Cast Aluminum Alloy. Designed for use with the "Universal No. 2", and "Aerating Type" Ventilator.

Hole in roof to be cut 4½″ diameter.

No. 40 REGULATIVE GRILL

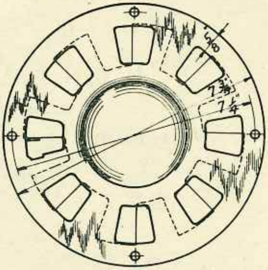


Weight, ½ lb.

Polished Cast Aluminum Alloy. Designed for use with the "Universal No. 2" Ventilator.

Hole in roof to be cut 4½″ diameter.

No. 50 DOME LIGHT REGULATIVE GRILL

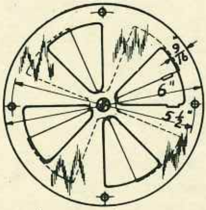


Weight, 1½ lbs.

Polished Cast Aluminum Alloy. Designed for use with the "Aerating Type" Ventilator.

Hole in roof to be cut 6¾" dia.

No. 60 REGULATIVE GRILL

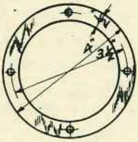


Weight, ½ lb.

Polished Cast Aluminum Alloy. Designed for use with the "Aerating Type" Ventilator.

Hole in roof to be cut 5" dia.

No. 70 CEILING RING

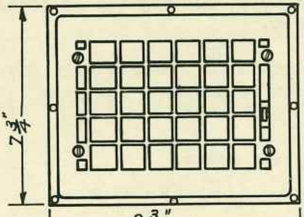


Weight, 2 ozs.

Polished Cast Aluminum Alloy. Designed for use with the "Universal No. 3" Ventilator.

Hole in roof to be cut 3" dia.

No. 80 OPEN GRILL
No. 90 REGULATIVE REGISTER



Black Japanned Wrought Steel. Designed for use with the type "A", type "C", and Special Railway Ventilators.

More complete description of this register given on page 24.

Grills of Special Finish furnished Upon Request

R. B. CLAPP & CO.

Sales Engineers

Steam and Steel Plant Equipment

Leader-News Building
CLEVELAND, OHIO

February 2, 1925.

The Nichols-Lintern Co.,
Cleveland, Ohio.

Gentlemen: AIR FLOW MEASUREMENTS

The Precision Anemometer, which you are using, will give a very good indication of the amount of air passing through your ventilators if used in the proper way.

The fan wheel with its integrating hands measures lineal feet per minute. The readings should be multiplied by the area of the ventilator opening to arrive at the cubical measurements of the air passing thru the ventilator.

In testing a ventilator of say 6 inches in diameter it is most impossible to measure the exhaust correctly unless the anemometer is centrally located in a six inch cylinder, leaving the cylinder clear around the instrument.

Testing ventilators in this manner will give you results that will be quite accurate for your purpose.

Very truly yours,

R.B.Clapp

RBC:JM Mechanical Engineer.

N-L

VENTILATORS

—lay low on the roof

—are easily installed

—are weatherproof
and noiseless

—are unexcelled for
appearance

—and

THEY VENTILATE

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